IN THE CLAIMS

32. (previously presented) A method for estimating a property of a fluid, comprising:

(a) transmitting a first acoustic pulse in a first member that is in contact with the fluid;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.

33. (currently amended) The method of claim 32 ~~1~~, wherein the property of the fluid comprises ~~one~~ at least one of the set consisting of acoustic impedance, density and viscosity of the fluid.

34. (currently amended) The method of claim 32 ~~1~~, further comprising:

estimating a reflection coefficient of the interface between the first member and the fluid.

35. (currently amended) The method of claim 32 ~~1~~, further comprising:

estimating an acoustic impedance of the first member.

36. (currently amended) The method of claim 32 ~~1~~, further comprising:

estimating a slope of energy decay for the plurality of acoustic pulse echo returns.

37. (currently amended) The method of claim 36 ~~5~~, wherein estimating the slope of energy decay comprises performing a least squares fit to the plurality of acoustic pulse echo returns.

38. (currently amended) The method of claim 36 ~~5~~, wherein estimating the slope of energy decay comprises dividing each of the plurality of acoustic pulse echo returns into a plurality of time windows.

39. (currently amended) The method of claim 38 ~~7~~, wherein estimating the slope of energy decay further comprises integrating over each of the plurality of time windows.

40. (currently amended) The method of claim 36 ~~5~~, wherein estimating the slope of energy decay further comprises subtracting noise from each of the plurality of acoustic pulse echo returns.

41. (currently amended) The method of claim 32 ~~1~~, further comprising:

transmitting a second acoustic pulse through the fluid; and

estimating speed of sound through the fluid, using round trip travel time for the second acoustic pulse between the first member and a second member that is in contact with the fluid.

42. (currently amended) The method of claim 32 ~~1~~, further comprising:

transmitting a second acoustic pulse through the fluid; and

estimating attenuation of the second acoustic pulse through the fluid.

43. (currently amended) The method of claim 42 ~~11~~, wherein estimating the attenuation includes estimating the attenuation at a plurality of frequencies.

44. (currently amended) The method of claim 41 ~~10~~, wherein transmitting the second acoustic pulse further comprises transmitting a plurality of acoustic pulses at a plurality of frequencies.

45. (currently amended) The method of claim 32 ~~1~~, wherein the method is performed downhole.

46. (previously presented) An apparatus for estimating a property of a fluid, comprising:

a vessel that contains the fluid;

an acoustic pulser that transmits a first acoustic pulse into a first vessel member that is in contact with the fluid;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first vessel member and the fluid; and

a processor that estimates the property of the fluid from the plurality of acoustic pulse echo returns.

47. (currently amended) The apparatus of claim 46 ~~15~~, wherein the vessel comprises ~~one~~ ~~of~~ at least one of the set consisting of a flask, pipe, conduit, sample chamber, flow pipe, tube, channel, and downhole tool housing.

48. (currently amended) The apparatus of claim 46 ~~15~~, wherein the property comprises ~~one of~~ at least one of the set consisting of acoustic impedance, density and viscosity of the fluid.

49. (currently amended) The apparatus of claim 48 ~~17~~, wherein the processor estimates a reflection coefficient of the interface between the first vessel member and the fluid.

50. (currently amended) The apparatus of claim 49 ~~18~~, wherein the processor measures acoustic impedance of the first vessel member.

51. (currently amended) The apparatus of claim 45 ~~15~~, wherein the processor estimates a slope of energy decay for the plurality of acoustic pulse echo returns.

52. (currently amended) The apparatus of claim 51 ~~20~~, wherein the processor performs a least squares fit to the plurality of acoustic pulse echo returns.

53. (currently amended) The apparatus of claim 51 ~~20~~, wherein the processor divides each of the plurality of acoustic pulse echo returns into a plurality of time windows to reduce noise.

54. (currently amended) The apparatus of claim 53 ~~22~~, wherein the processor integrates over each of the plurality of time windows.

55. (currently amended) The apparatus of claim 51 ~~20~~, wherein the processor estimates the slope of energy decay from a value adjusted for noise for each of the plurality of acoustic pulse echo returns.

56. (currently amended) The apparatus of claim 46 ~~15~~, wherein the acoustic pulser transmits a second acoustic pulse through the fluid and the processor estimates the speed of sound through the fluid using the round trip travel time for the second acoustic pulse between the first vessel member and a second member that is in contact with the fluid.

57. (currently amended) The apparatus of claim 46 ~~15~~, wherein the acoustic pulser transmits a second acoustic pulse through the fluid and the processor estimates attenuation of the second acoustic pulse through the fluid.

58. (currently amended) The apparatus of claim 57 ~~26~~, wherein the processor estimates the attenuation at a plurality of frequencies.

59. (currently amended) The apparatus of claim 56 ~~25~~, wherein the acoustic pulser transmits a plurality of pulses at a plurality of frequencies.

60. (currently amended) The apparatus of claim 46 ~~15~~, wherein the apparatus is located downhole.

61. (previously presented) A method for estimating a property of a fluid, comprising:

(a) generating a first acoustic pulse in the fluid that is in contact with a first member;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.

62. (previously presented) An apparatus for estimating a property of a fluid, comprising:

a chamber that contains the fluid;

a transmitter that sends a first acoustic pulse into the fluid that is in contact with a first chamber member;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first chamber member and the fluid; and

a processor that estimates the property of the fluid using the plurality of acoustic pulse echo returns.

63. (previously presented) A downhole tool which is deployed in a borehole for estimating a property of a downhole fluid, comprising:

a vessel that contains the fluid;

an acoustic pulser that transmits a first acoustic pulse into a first vessel member that is in contact with the fluid;

a transducer that detects a plurality of acoustic pulse echo returns from an interface between the first vessel member and the fluid; and

a processor that estimates the property of the fluid using the plurality of acoustic pulse echo returns.

64. (currently amended) The downhole tool of claim 63 ~~32~~, wherein the vessel comprises one of a flask, pipe, conduit, sample chamber, flow pipe, tube, channel and downhole tool housing.

65. (currently amended) The downhole tool of claim 64 ~~33~~, wherein the property comprises one of acoustic impedance, density and viscosity of the fluid.

66. (currently amended) The downhole tool of claim 65 ~~34~~, wherein the processor estimates a reflection coefficient of the interface between the first vessel member and the fluid.

67. (currently amended) The downhole tool of claim 63 ~~32~~, wherein the processor estimates a slope of energy decay for the plurality of acoustic pulse echo returns.

68. (currently amended) The downhole tool of claim 67 ~~36~~, wherein the processor performs a least squares fit to the plurality of acoustic pulse echo returns.

69. (previously presented) A method for estimating a property of a fluid, comprising:

(a) generating a first acoustic pulse in a first member that is in contact with the fluid;

(b) detecting a plurality of acoustic pulse echo returns from an interface between the first member and the fluid; and

(c) estimating the property of the fluid from the plurality of acoustic pulse echo returns.